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Pesticide Fact Sheet Number 177: Bifenthrin

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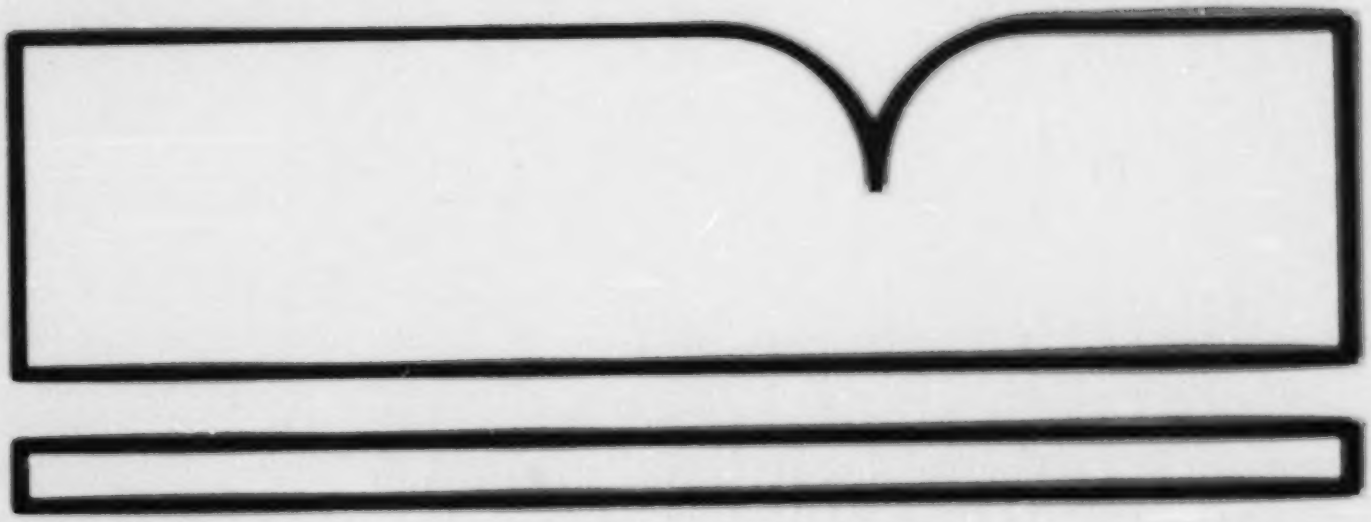

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

eg.: bifenthrin.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

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EPA

Pesticide Fact Sheet

Name of Chemical: Bifenthrin
Reason for Issuance: Amended Registration First Food Use
Date Issued: October 1988
Fact Sheet Number: 177

1. DESCRIPTION OF CHEMICAL

Generic Name: (2-methyl[1,1-biphenyl]-3-yl)-methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethyl cyclopropanecarboxylate
Common Name: Bifenthrin
Other Proposed Names: Biphenate, biphenthrin
Trade Names: Brigade, Capture, Talstar
Code Number: FMC 54800
EPA Shaughnessy No.: 128825
Chemical Abstracts Service (CAS) Number: 82657-04-3
Year of Initial Registration: 1985
Pesticide Type: Insecticide/Miticide
Chemical Family: Pyrethroid
U.S. and Foreign Producers: FMC Corporation

2. USE PATTERNS AND FORMULATIONS

Application Sites: Greenhouse Ornamentals, Cotton
Types and Methods of Application: Foliar Spray
Application Rates: 0.004 to 0.02 lb ai per 10 gallons of spray
Types of Formulations: 90% technical, 10 WP, and 2EC
Limitations: RESTRICTED USE PESTICIDE. Toxic to fish and aquatic organisms. For retail sale to and use only by Certified Applicators, or persons under their direct supervision and only for the uses covered by the certified applicator's certification.

3. SCIENCE FINDINGS

Summary Science Statement: Bifenthrin, a synthetic pyrethroid insecticide/miticide, is very highly toxic to fish and aquatic invertebrates. It is highly toxic to mammals by the oral route, with rat oral LD_{50} values of 70.1 and 53.8 mg/kg for males and females, respectively. There was no evidence of any oncogenic effects in a 2-year dietary (0, 12, 50, 100 and 200 ppm) study

in rats. However, a mouse feeding oncogenicity study (87 weeks for males, 92 weeks for females) with dose levels of 0, 50, 200, 500, and 600 ppm showed a significantly elevated incidence of leiomyosarcoma of the urinary bladder of males at 600 ppm. On the basis of a statistically highly significant ($p = 0.00053$) dose-related trend of increased tumor incidence (and the significantly increased incidence at 600 ppm) of leiomyosarcoma of the urinary bladder in male mice, the Agency has classified bifenthrin as a class C (possible human) oncogen. A Q_1^* of 5.4×10^{-1} $(mg/kg/day)^{-1}$ in human equivalents has been calculated. The "worst case" incremental dietary oncogenic risk associated with complete treatment of the cotton crop and maximum allowable residues is calculated to be 6.0×10^{-6}. Actual risk would be less since no more than 25 percent of the cotton crop is likely to be treated. It has not demonstrated any teratogenic effects at the highest levels tested.

Chemical Characteristics:

Physical State: Solid
Color: Off-white to pale tan
Odor: Very weak, aromatic
Boiling Point: Not applicable
Melting Point: 68 to 70.6 degrees C
Vapor Pressure: 1.81×10^{-7} torr at 25 degrees C
Solubility: Water: < 0.1 ppb
Organic Solvents: Soluble in methylene chloride, chloroform, acetone, ether, and toluene.
Dissociation Constant: Not applicable due to the extremely low water solubility.
Octanol/Water Partition Coefficient: $> 1 \times 10^6$
pH: 5.4 to 6.0
Oxidizing or Reducing Action: Has not demonstrated potential for acting as an oxidizing or reducing agent under normal handling and use conditions.
Storage Stability: Preliminary studies indicate excellent storage stability.

Toxicology Characteristics:

Acute Oral LD_{50} - Rat: 53.8 mg/kg (females), 70.1 mg/kg (males) (Category III)
Acute Dermal LD_{50} - Rabbit: > 2000 mg/kg (Category III)
Teratology - Rat: Maternal toxicity NOEL = 1 mg/kg/day; Developmental toxicity NOEL = 1 mg/kg/day
Teratology - Rabbit: Maternal toxicity NOEL = 2.67 mg/kg/day; Developmental toxicity NOEL > 8 mg/kg/day
2-Generation - Rat: Maternal toxicity NOEL = 30 ppm
Reproductive toxicity NOEL > 100 ppm
Developmental toxicity NOEL > 100 ppm
90-Day Feeding - Rat: NOEL = 50 ppm (2.5 mg/kg/day)
13-Week Feeding - Dog: NOEL = 2.21 mg/kg/day

1-Year Feeding - Dog: NOEL = 0.75 mg/kg/day
2-Year Feeding/Oncogenicity Study - Rat:
Systemic toxicity NOEL = 50 ppm (2.5 mg/kg/day)
Oncogenic toxicity LEL > 200 ppm (10 mg/kg/day)
87-Week Oncogenicity - Mouse:
Oncogenic LEL = 50 ppm (7.5 mg/kg/day)
Mutagenicity:
- Positive assay in mouse lymphoma, forward mutation (gene mutation)
- Negative in other assays including CHO cells, Ames test, UDS up to 2.5 uL/mL, and in vivo rat bone marrow cells (categories of gene mutation, genotoxicity, and chromosome aberration)

Physiological and Biochemical Behavioral Characteristics:

Foliar Absorption: Not absorbed
Translocation: Not translocated
Mechanism of Pesticide Action: Neurotoxicity characteristic of pyrethroid insecticides

Environmental Characteristics:

Absorption and Leaching in Soil: Immobile in soils with high exchange capacity containing large amounts of organic matter, clay and silt. Low mobility in soils with low exchange capacity such as sandy soil low in organic matter.

Hydrolysis: Bifenthrin is expected to be stable to hydrolysis. Additional data would be needed to more fully characterize its activity.

Aerobic Soil Metabolism: Bifenthrin will aerobically degrade in soil with a half-life of 3 to 8 months. Additional information would be needed to more fully characterize its activity.

Environmental Fate and Surface and Ground Water Contamination Concerns: No concerns at this time.

Exposure of Humans and Nontarget Organisms to Chemical or Degradates: Applicator exposure in greenhouse and field use (cotton) and, if improperly used, exposure to fish and invertebrate animals.

Exposure During Reentry Operations: No special precautions needed in greenhouses once spray residues are dry; however, for cotton use the following precautions are required:

> Do not apply this product in such a manner as to directly or through drift expose workers or other persons. The area being treated must be vacated by unprotected persons. Do not enter treated areas without protective clothing until sprays have dried. Because certain States may require

more restrictive reentry intervals for crops treated with this product, consult your State Department of Agriculture for further information.

Ecological Characteristics:

Hazards to Fish and Wildlife - Birds: Mallard duck LD_{50} < 2150 mg/kg Bobwhite quail LD_{50} 1800 mg/kg; low acute toxicity to birds but concern about possible bioaccumulation.

Fish - Bluegill sunfish: 96-hr LD_{50} 0.18 parts per billion (ppb); rainbow trout 96-hr LD_{50} 0.10 ppb; very high toxicity to fish plus concern with persistence in water and on soil and organic material found in water.

Aquatic Invertebrates - Daphnia magna: 48-hr EC_{50} 1.6 ppb; very high toxicity to freshwater invertebrate animals. Mysidopsis bahia: 96-hr LC_{50} = 3.97 parts per trillion; very high toxicity to estuarine invertebrate animals. Concern about persistence in water. Additional data are needed to fully characterize bifenthrin toxicity to aquatic organisms.

Tolerance Assessment:

Commodities	Parts Per Million (ppm)
Cottonseed	0.5
Meat, fat, and meat byproducts of cattle, goats, hogs, horses, and sheep	0.1
Milk	0.02

The acceptable daily intake, based on a NOEL of 1.5 mg/kg/day from a 1-year dog feeding study and a safety factor of 100 is 0.015 mg/kg body weight/day. The theoretical maximum residue contribution from the above tolerances is 0.000445 mg/kg body weight/day.

Reported Pesticide Incidents: None

4. SUMMARY OF REGULATORY POSITION AND RATIONALE

Bifenthrin, formulated as a wettable powder and an emulsifiable concentrate, is registered for use on greenhouse ornamentals and cotton. Because of toxicity to fish and aquatic invertebrates, precautionary labeling is required to warn against contamination of bodies of water, endangered species restrictions, special equipment for closed loading systems, and protective clothing for applicators and mixers/loaders when applying products containing bifenthrin.

5. SUMMARY OF DATA GAPS

Name of Study	GRN	Due Date
Estuarine Mollusc Acute Test	72-3	Received, under review
Fish Life Cycle	72-5	August 1988
Simulated or Actual Aquatic Field Test	72-7	January 1989
Volatility (Lab)	163-2	August 1989
Aquatic Invertebrate Life Cycle (Fresh Water)	72-4	October 1989
Aquatic Invertebrate Life Cycle (Estuarine)	72-4	October 1989
Soil Dissipation	164-1	November 1990
Confined Crop Rotation	165-1	October 1991

6. CONTACT PERSON AT EPA

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DISCLAIMER: The information presented in this Fact Sheet is for informational purposes only and may not be used to fulfill data requirements for pesticide registration and reregistration.